A Web-Based System for Interactive Visualization and Exploration of Time-oriented Clinical Data and Their Abstractions

Yuval Shahar M.D., Ph.D.[1], David Boaz, B.Sc.[1], Gil Tahan[1], Maya Galperin, M.D.[1], Dina Goren-Bar, Ph.D.[1], Herbert Kaizer, M.D., Ph.D.[2], Lawrence V. Basso, M.D.,M.Sc.[2,3], Susana B. Martins, M.D., M.Sc.[4], Mary K. Goldstein, M.D., M.Sc.[2,4]

[1]Medical Informatics Research Center, Department of Information Systems Engineering Ben Gurion University, Beer Sheva, Israel; [2]Stanford University School of Medicine, Stanford, CA; [3]Palo Alto Medical Foundation, CA; [4]Veterans Affairs Heath Care System, Palo Alto, CA

In this theater-style demonstration, we will demonstrate **KNAVE-II**, a Web-based distributed system for interactive visualization and exploration of large amounts of time-oriented clinical data from multiple sources, and of clinically meaningful concepts (*abstractions*) derivable from these data.

The KNAVE-II system and its complete underlying architecture provide a solution to the *data overload problem*: Care providers are often overwhelmed by the amount of time-oriented data associated with patient records, such as those of chronic patients. Interpretations (abstractions) of these data often depend on specific clinical contexts. Providing visualization of the data and of their context-sensitive, clinically meaningful interpretations, and a capability to easily explore both, has multiple beneficial implications for clinical care, research, and quality assessment.

The KNAVE-II system extends our prior work on visualization of time-oriented clinical information[1].

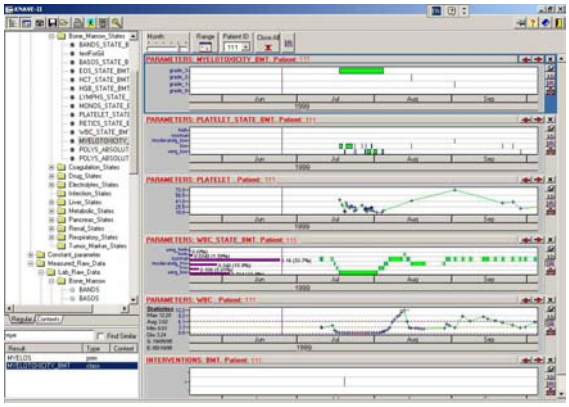

Figure 1: An exploration of the data of an oncology patient in the KNAVE-II system. On the left is a browser to the domain's *ontology*, derived from the knowledge base. Users search or select raw data or abstract concepts in the ontology, which are then retrieved or computed on the fly and displayed as panels on the right. Specialized operators (icons in each panel) enable users to perform actions such as explore semantically related concepts, display the knowledge used to derive the concept, and show statistics.

The KNAVE-II system uses **IDAN**, a distributed *temporal-abstraction mediator* we have developed, which integrates multiple clinical-*data sources*, medical *knowledge sources*, and a *computational service* that uses the knowledge-based temporal-abstraction framework[2]. A *vocabulary service* is used by database administrators and knowledge engineers to map ground terms in the data and knowledge sources into standard terms from a set of medial vocabularies. Medical experts update the knowledge sources using a *knowledge-acquisition tool*.

The innovative KNAVE-II interface (Figure 1) enables users to browse over any time period both raw data and clinically meaningful concepts, which are computed on the fly from the data and the domain-specific knowledge, or to zoom in and out of the data, by specifying a time range, by marking particular contents, or by simply changing the temporal granularity (e.g., from *Days*, into *Months* or *Years*). The KNAVE-II computational module interacts with IDAN, and supports tasks such as exploration of the raw data and abstractions along multiple links in the semantic network underlying the data and concepts; computation of context-sensitive statistics for any time range on the fly; generation of explanations for derived patterns (e.g., "*What data is this concept abstracted from?*" or "*What knowledge was used to derive this pattern?*"), and saving the whole exploration for further use and collaboration.

We are currently evaluating the functionality and usability of the KNAVE-II system.

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References

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